THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

_____

Ex parte STEVEN M. PENN, DAVID N. JONES and MICHAEL E. EMBREE

_____

Appeal No. 1997-1380[1]
Application 08/301,508

_____

ON BRIEF

_____

Before COHEN, McQUADE and GONZALES, Administrative Patent Judges.

McQUADE, Administrative Patent Judge.

DECISION ON APPEAL

Steven M. Penn et al. originally took this appeal from

[1] Application for patent filed September 7, 1994. According to appellants, the application is a continuation of Application 07/923,278, filed July 31, 1992; which is a continuation-in-part of Application 07/905,069, filed June 24, 1992, now U.S. Patent No. 5,206,009, issued November 9, 1993; which is a continuation of Application 07/648,081, filed January 31, 1991, now abandoned.

the final rejection of claims 1 through 18.[2] Upon reconsideration, the examiner has withdrawn the rejections of claims 6 through 8 and 16 which now stand objected to as depending from rejected base claims (see the supplemental answer, Paper No. 13). Thus, the appeal as to claims 6 through 8 and 16 is hereby dismissed, leaving for review the standing rejections of claims 1 through 5, 9 through 15, 17 and 18. Claims 19 through 23, the only other claims pending in the application, stand withdrawn from consideration pursuant to 37 CFR § 1.142(b).

The subject matter on appeal relates to an apparatus and method "for manufacture of three-dimensional objects from computer data using computer-controlled dispensing of multiple media and selective material subtraction" (specification, page 1). Claims 1 and 13 are illustrative and read as follows:

1. An apparatus for producing a three-dimensional object, comprising:

a platform for supporting a target surface; and

an integrated printhead for forming a layer over said target surface, said integrated printhead movable relative to said platform, comprising:

[2] Claim 13 has been amended subsequent to final rejection.

a first jet for controllably dispensing a first material at selected locations of said target surface; and

a dispenser mounted on said printhead in a lagging spaced-apart relationship relative to said first jet in a direction of movement of said integrated printhead relative to said platform, for dispensing a second material at other locations of said target surface simultaneously with said first jet.

13. A method of producing a three-dimensional object comprising the steps of:

moving an integrated printhead across a target surface, said integrated printhead comprising a first jet for controllably dispensing a liquid first material at said target surface and a dispenser for dispensing a liquid second material mounted on said printhead in a spaced-apart relationship relative to said first jet;

during said moving step, controllably dispensing said first material via said first jet at selected locations of said target surface corresponding to a cross section of the object, wherein said first material solidifies after being dispensed;

during said dispensing, dispensing said second material via said dispenser at other locations of said target surface simultaneously at which said first jet is dispensing said first material, wherein said second material solidifies after being despensed, to complete a layer over said target surface to form another target surface at a top surface of said first material; and

repeating said moving, controllably dispensing to form a body comprised of said first and second materials.

The references relied upon by the examiner as evidence of

anticipation and obviousness are:

Helinski 5,136,515 Aug. 4, 1992
(filed Nov. 7, 1989)
Pomerantz et al. (Pomerantz) 5,031,120 Jul. 9, 1991
(filed Dec. 22, 1988)
Chevalier et al. (Chevalier) 5,350,477 Sep. 27, 1994
(§ 102(e) date of Apr. 23, 1991)

Claims 1 and 13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Helinski.

Claims 2 through 5, 11, 12, 14, 15, 17 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Helinski in view of Pomerantz.

Claims 9 and 10 stand rejected under 35 U.S.C. § 103 as being unpatentable over Helinski in view of Pomerantz, and further in view of Chevalier.

Reference is made to the appellants' main and reply briefs (Paper Nos. 10 and 12) and to the examiner's main answer (Paper No. 11) for the respective positions of the

appellants and the examiner with regard to the merits of these rejections.[3]

Helinski, the examiner's primary reference, discloses a CAD-controlled apparatus and method for the layer-by-layer production of a three-dimensional article. As described by Helinski,

> [p]ractice of the invention requires two jetting heads, one supplied with material that will form the fabricating particles, and the other with material that will form the support particles. Numerous alternatives to this scheme are also possible. For example, a single jetting head incorporating two feeder lines may be used. In a different configuration, a first linear array of fabricating-particle jets and a second linear array of support-particle jets may be employed. The single-jet scheme offers compactness and economy, while the array scheme permits deposition of a layer in a shorter time.
>
> . . .
>
> The jetting head or heads 10 are connected by means of suitable electronic and mechanical linkages to one or more servo mechanisms 12, which are responsive to commands issued by a controller 14.

[3] In light of the amendment made to claim 13 subsequent to final rejection (see n.2), the examiner has withdrawn the 35 U.S.C. § 112, second paragraph, rejection of claims 13 through 15, 17 and 18 which was set forth in the final rejection (see the advisory action mailed October 11, 1995, Paper No. 7).

> The controller translates the coordinates representing a layer of the design (as compiled by the CAD system) into suitable servo commands to position the fabricating-particle jet above the corresponding position on the substrate 16 that will support the construction. The controller then causes a droplet 18 of particle material to be ejected. A complementary set of commands is issued by the controller to the support-particle jet, causing it to deposit droplets of support material 20 on positions of the substrate not occupied (or to be occupied) by fabrication particles. After deposition of this initial layer, subsequent layers are similarly formed on top of and in contact with one another.
>
> . . .
>
> After all layers have been deposited, the structure consisting of the fused fabrication particles must be separated from the mass of support particles [column 2, lines 23 through 68].

Claims 1 and 13, the two independent claims on appeal, stand rejected under 35 U.S.C. § 102(e) as being anticipated by Helinski. Anticipation, of course, is established only when a single prior art reference discloses, expressly or under principles of inherency, each and every element of a claimed

invention. RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984).

The appellants contend that the invention recited in claims 1 and 13 is not anticipated by Helinski because Helinski does not meet the limitation in claim 1 requiring the dispenser to be capable of dispensing a second material simultaneously with the dispensing of the first material from the first jet, or the corresponding limitation in claim 13 requiring the dispensing of the second material via the dispenser simultaneously with the dispensing of the first material via the first jet.

The appellants' position here is belied by Helinski's drawing figure which shows the droplets of particle material 18 and support material 20 being dispensed simultaneously from their respective jets/dispensers 10. Thus, the appellants' argument that Helinski is not anticipatory with respect to the subject matter recited in claims 1 and 13 is unconvincing. Accordingly, we shall sustain the standing 35 U.S.C. § 102(e) rejection of these claims.

As for the standing 35 U.S.C. § 103 rejection of dependent claims 2 through 5, 11, 12, 14, 15, 17 and 18 as being unpatentable over Helinski in view of Pomerantz,

Pomerantz discloses a CAD-controlled system for the layer-by-layer production of a three-dimensional physical model made of radiation polymerizable resin. The system 500, which is illustrated schematically in Figure 22, includes a mask producing subsystem 502 and a physical model producing subsystem 504. Subsystem 502 produces mask-bearing substrates 514 corresponding to respective layers of the physical model. As described by Pomerantz,

> [i]n the physical model producing subsystem 504, the mask bearing substrate is precisely positioned in operative engagement with an exposure unit 530 . . . .
>
> The three dimensional model is built up layer by layer on a model support surface 534 which can be selectably positioned along the X and Z axes by suitable conventional positioning apparatus 536. Initially the model support surface 534 is located in operative engagement with and under a resin applicator 540 . . . .
>
> Applicator 540 . . . is operative to provide a layer 550 of resin onto support surface 534 which layer is of generally uniform thickness, typically 0.15 mm. Following application of a resin layer thereto, the surface 534 is positioned in operative engagement with, and under exposure unit 530, such that the mask [515] formed on substrate 514 lies intermediate the light source and the layer 550 in proximity to layer 550 . . . permitting exposure of the layer 550 through the mask 515 and consequent hardening of the exposed regions of the layer 550. . . .

> The mask 515 together with its substrate 514 is returned to the mask producing subsystem 502 for cleaning and preparation of a subsequent mask. . . .
>
> While a subsequent mask is being produced, the model generation process continues: the exposed layer 550 is positioned in operative engagement with a fluid strip generator 560 for removal of unhardened resin from layer 550 . . . .
>
> The thus cleaned layer 550 is then transported into operative engagement with a support material applicator unit 570 . . . [to] provide a support material to fill in those regions in layer 550 from which the unsolidified solidifiable material was removed. Preferably the support material comprises a melted wax . . . .
>
> After application of the melted wax to layer 550, the layer is preferably transported into operative engagement with a cooling unit 580 . . . . The wax [in] layer 550 is cooled by intimate contact with cooled plate 582 in order to solidify it as quickly as possible prior to further processing . . . .
>
> Following solidification of the wax in layer 550, the layer is transported into operative engagement with a machining unit 590, typically comprising a conventional multi-blade fly cutter 592 driven by a motor 594 and associated with a dust collection hood 596 and vacuum cleaner 598. Machining unit 590 is operative to trim the top surface of layer 550 to a precise, flat uniform thickness by removing, as appropriate, excessive thicknesses of both the solidified solidifiable material and the solidified support material.

It will be appreciated that the operation of

> the system for a single layer as described above is repeated multiple times, as the support surface 534 is lowered correspondingly, producing a multilayer built up model having precisely controlled dimensions [column 17, line 50, through column 19, line 7].

Dependent claim 2 requires the integrated printhead recited in parent claim 1 to further comprise means for planarizing the layer formed by the first jet and the dispenser. Acknowledging that Helinski does not disclose a planarizing means, the examiner submits that

> Pomerantz et al teaches a three dimensional modelling [sic, modeling] apparatus wherein the integrated printhead (504) comprises means for planarizing the layer formed by applicators (540,570). Therefore, it would have been obvious to one person ordinary skilled in the art to have modified Helinski to include means for planarizing the layer formed by the first jet and the dispenser (answer, page 4).

Although Pomerantz discloses a planarizing means in the form of machining unit 590, the examiner's assertion that such means is part of an integrated printhead has no basis in the reference. In short, there is nothing in the combined teachings of Helinski and Pomerantz which would have suggested

an apparatus having an integrated printhead comprising a planarizing means as recited in claim 2. Accordingly, we shall not sustain the standing 35 U.S.C. § 103 rejection of claim 2, or of claims 3 through 5, 11 and 12 which depend therefrom, as being unpatentable over Helinski in view of Pomerantz.

Since Chevalier's disclosure of a method and apparatus for manufacturing a fibrous product having an adhesive coating does not cure the foregoing deficiencies of Helinski and Pomerantz with respect to the subject matter recited in claim 2, we shall not sustain the standing 35 U.S.C. § 103 rejection of claims 9 and 10, which depend from claim 2, as being unpatentable over Helinski in view of Pomerantz, and further in view of Chevalier.

Dependent claim 14 requires the method recited in parent claim 13 to further comprise the step of planarizing the layer to form a substantially planar target surface. Here, the examiner's conclusion (see pages 6 and 7 in the main answer)

that it would have been obvious to a person having ordinary skill in the art in view of Pomerantz to provide the method disclosed by Helinski with a planarizing step as broadly recited in claim 14 is well taken. Pomerantz's disclosure of using machining unit 590 to trim the top surface of layer 550 to a precise flat uniform thickness would have furnished the artisan with ample motivation or suggestion for the proposed modification of the Helinski method. Therefore, we shall sustain the standing 35 U.S.C. § 103 rejection of claim 14 as being unpatentable over Helinski in view of Pomerantz.

Claim 15 depends from claim 14 and further defines the planarizing step as being performed during the moving step (recited in parent claim 13) in a spaced apart relationship relative to the first jet and the dispenser. There is simply nothing in the combined teachings of Helinski and Pomerantz which would have suggested performing the planarizing step during this
time. Thus, we shall not sustain the standing 35 U.S.C. § 103

rejection of claim 15, or of claim 17[4] which depends therefrom, as being unpatentable over Helinski in view of Pomerantz.

Finally, we shall sustain the standing 35 U.S.C. § 103 rejection of claim 18, which depends from claim 13, as being unpatentable over Helinski in view of Pomerantz. As pointed out by the examiner (see page 8 in the main answer), Helinski discloses the selective removing step recited in this claim.

In summary, the decision of the examiner to reject claims 1 through 5, 9 through 15, 17 and 18 is affirmed with respect to claims 1, 13, 14 and 18, and reversed with respect to claims 2 through 5, 9 through 12, 15 and 17.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

[4] Claim 17 depends from claim 15 through claim 16. It is unclear why the examiner withdrew the rejection at issue with respect to claim 16 but not claim 17.

IRWIN CHARLES COHEN Administrative Patent Judge	)
JOHN P. McQUADE Administrative Patent Judge	) BOARD OF PATENT) APPEALS AND) INTERFERENCES
JOHN F. GONZALES Administrative Patent Judge	)

JPM/pgg
W. Daniel Swayze Jr.
Texas Instruments Incorporated
P.O. Box 655474 M S 219
Dallas, TX 75265